WHAT IS CLAIMED IS:

1. A method for fabricating a buried semiconductor laser device comprising the steps of:

forming a mesa structure including a bottom cladding layer, an active layer and an upper cladding layer overlying a semiconductor substrate, the mesa structure having at least one side surface with the active layer having an exposed side thereat; and

growing a first current-confinement layer on the mesa's at least one side surface, the first current-confinement layer comprising a semiconductor material and having a first conductivity type;

growing a second current-confinement layer above at least a portion of the first current-confinement layer, the second current-confinement layer comprising a semiconductor material and having a second conductivity type which is opposite to the first conductivity type; and

wherein the first current-confinement layer is grown at a temperature ranging from 610 °C to 700 °C using a raw material gas containing a group V element gas and a group III element gas at a molar ratio of the group V element gas with respect to the group III element gas between 50 and 500, inclusive.

2. The method as defined in claim 1 wherein the first current-confinement layer is grown at a temperature ranging from 640 °C to 670 °C using a raw material gas containing a group V element gas and a group III element gas at a molar ratio of the group V element gas with respect to the group III element gas between 80 and 320.

3. The method as defined in claim 1, wherein the second current-confinement layer is formed using a raw material gas having a molar ratio different from the molar ratio used in the formation of the first current-confinement layer.

4. The method as defined in claim 3, wherein the first current-confinement layer and the second current-confinement layer are grown at substantially the same temperature.

5. The method as defined in claim 3, wherein the molar ratio used for the formation of the second current confinement layer is larger than that used for the formation of the first current confinement layer.

6. The method as defined in claim 3, wherein the molar ratio used for the formation of the second current confinement layer is smaller than that used for the formation of the first current confinement layer.

7. The method as defined in claim 6, wherein the molar ratio used for the formation of the second current confinement layer is in a range from 30 to 80, inclusive.

8. The method as defined in claim 7, wherein the molar ratio used for the formation of the first current confinement layer is in a range from 80 to 320, inclusive.

9. The method as defined in claim 1, wherein the first current-confinement layer is formed at a first growth temperature, and wherein the second current-confinement layer is formed at a second growth temperature which is different from the first growth temperature.

10. The method as defined in claim 9, wherein the first current-confinement layer and the second current-confinement layer are grown with molar ratios which are substantially the same.

11. The method as defined in claim 9, wherein second growth temperature is lower than the first growth temperature.

12. The method as defined in claim 9, wherein second growth temperature is higher than the first growth temperature.

13. The method as defined in claim 1 wherein the substrate has an n-type conductivity, wherein the first conductivity type is p-type, and wherein the second

conductivity type is n-type.

14. The method as defined in claim 1 wherein the substrate has a p-type conductivity, wherein the first conductivity type is p-type, and wherein the second conductivity type is n-type.

15. The method as defined in claim 3 further comprising the step of growing a third current-confinement layer above the second current-confinement layer, the second current-confinement layer comprising semiconductor material and having the first conductivity type, wherein third current-confinement layer is formed with a raw material gas having a molar ratio different from the molar ratio used in the formation of the first current-confinement layer.

16. The method as defined in claim 15, wherein the molar ratio used for the formation of the third current confinement layer is larger than that used for the formation of the first current confinement layer.

17. The method as defined in claim 1 wherein the temperature at which the first current-confinement layer is grown is represented by a temperature T;

wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas equal to or greater than the quantity $(1.5 \cdot T - 925)$ when the growth temperature is between 650 °C and 680 °C, inclusive; and

wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas equal to or greater than the quantity $(6.67 \cdot T - 4{,}349)$ when the growth temperature is greater than 680 °C and less than or equal to 700 °C.

18. The method as defined in claim 17 wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas equal to or greater than the quantity $(2.0 \cdot T - 1{,}220)$ when the growth

temperature is between 650 °C and 670 °C, inclusive; and

wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas equal to or greater than the quantity (6.67·T – 4,349) when the growth temperature is greater than 670 °C and less than 680 °C..

19. The method as defined in claim 17 wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas equal to or greater than the quantity (2.0·T – 1,180) when the growth temperature is between 650 °C and 670 °C, inclusive.

20. The method as defined in claim 1 wherein the temperature at which the first current-confinement layer is grown is represented by a temperature T;

wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas which is less than or equal to the quantity (13.0·T – 7,820) when the growth temperature is between 610 °C and 640 °C, inclusive.

21. The method as defined in claim 20 wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas which is less than or equal to the quantity (8.0·T – 4,820) when the growth temperature is between 610 °C and 640 °C, inclusive; and

wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas which is less than or equal to the quantity (20.0·T – 12,500) when the growth temperature is greater than 640 °C and less than or equal to 650 °C.

22. The method as defined in claim 20 wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas which is less than or equal to the quantity (2.5·T – 1,500) when the growth temperature is between 610 °C and 640 °C, inclusive; and

wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas which is less than or equal to the quantity (22.0·T – 13,980) when the growth temperature is greater than 640 °C and less than or equal to 650 °C.

23. The method as defined in claim 20 wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas which is less than or equal to the quantity (19.0·T – 12,110) when the growth temperature is between 640 °C and 650 °C, inclusive; and

wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas which is less than or equal to the quantity (11.0·T – 6,910) when the growth temperature is greater than 650 °C and less than or equal to 670 °C.

24. The method as defined in claim 23 wherein the first current-confinement layer is grown at a molar ratio of the group V element gas with respect to the group III element gas equal to or greater than the quantity (2.0·T – 1,180) when the growth temperature is between 650 °C and 670 °C, inclusive.

25. A method for fabricating a buried semiconductor laser device comprising the steps of:

forming a mesa structure including a bottom cladding layer, an active layer and a top cladding layer overlying an n-type semiconductor substrate; and

forming a current confinement structure by growing a p-type current blocking layer and an n-type current blocking layer on each side surface of the mesa structure and on a skirt portion extending from each side surface,

the p-type current blocking layer being fabricated at a growth temperature ranging from 610 °C to 700 °C and by using a raw material gas containing a group III element gas and a group V element gas at a molar ratio of the group V element gas with respect to the group III element gas between 50 and 500, inclusive.

26. The method as defined in claim 25, wherein the molar ratio is between 80 and 320, inclusive.

27. The method as defined in claim 25, wherein the n-type current blocking layer is formed by using another raw material gas having a molar ratio different from the molar ratio used for the formation of the p-type current blocking layer.

28. The method as defined in claim 27, wherein the molar ratio used for the formation of the n-type current blocking layer is larger than that used for the formation of the p-type current blocking layer.

29. A method for fabricating a buried semiconductor laser device comprising the steps of:

forming a mesa structure including a bottom cladding layer, an active layer and a top cladding layer overlying a p-type semiconductor substrate; and

forming a current confinement structure by growing a p-type separation layer, an n-type current blocking layer and a p-type current blocking layer on each side surface of the mesa structure and on a skirt portion extending from each side surface,

the p-type separation layer being fabricated at a growth temperature ranging from 610 °C to 700 °C and by using a raw material gas containing a group III element gas and a group V element gas at a molar ratio of the group V element gas with respect to the group III element gas between 50 and 500, inclusive.

30. The method as defined in claim 29, wherein the first molar ratio is between 50 and 500 inclusive, and the second molar ratio is between 30 and 80 inclusive.

31. The method as defined in claim 30, wherein the first molar ratio is between 80 and 320, inclusive.

32. The method as defined in claim 29, wherein the p-type separation layer, the n-type current blocking layer and the p-type current blocking layer are formed by using

the raw material gases having different molar ratios among one another.

33. The method as defined in claim 29, wherein a third molar ratio for forming the p-type current blocking layer is larger than the first molar ratio.

34. A buried semiconductor laser device formed on a semiconductor substrate having a top surface and a bottom surface, the laser device comprising:

a mesa structure formed at the top surface of the substrate and having a bottom cladding layer at the top surface of the substrate, an active layer overlaying the bottom cladding layer, and a top cladding layer overlying the active layer, the mesa structure having at least one side surface with the active layer having an exposed side thereat;

a first current-confinement layer overlaying at least a portion of the mesa's at least one side surface and having a first portion disposed against the exposed side of the active layer, the first current-confinement layer comprising a semiconductor material and having a first conductivity type;

a second current-confinement layer overlaying at least a portion of the first current-confinement layer, the second current-confinement layer comprising a semiconductor material and having a second conductivity type which is opposite to the first conductivity type; and

wherein the closest distance (Tn or Tp) between the second current-confinement layer and the active layer has a value in the range from 0.15 μm to 0.6 μm.

35. The laser device as defined in claim 34 wherein the substrate has an n-type conductivity, wherein the first conductivity type is p-type, and wherein the second conductivity type is n-type.

36. The laser device as defined in claim 35 wherein the first current confinement layer is a first current-blocking layer, and wherein the second current confinement layer is a second current-blocking layer.

37. The laser device as defined in claim 34 wherein the substrate has a p-type

conductivity, wherein the first conductivity type is p-type, and wherein the second conductivity type is n-type.

38. The laser device as defined in claim 37 wherein the first current confinement layer is a separation layer, and wherein the second current confinement layer is a first current-blocking layer.

39. The laser device as defined in claim 34 wherein the closest distance (Tn or Tp) has a value in the range from 0.2 μm to 0.4 μm, inclusive.

40. The laser device as defined in claim 34 wherein the closest distance (Tn or Tp) has a value in the range from 0.25 μm to 0.35 μm, inclusive.